

REMARKS

Claims 1-4 and 6-9 remain pending in the application, with claims 1-4 and 6-8 standing ready for further action on the merits, and claim 9 being withdrawn from consideration based on an earlier restriction requirement of the Examiner.

The amendment made herein to claim 1 does not incorporate new matter into the application as originally filed. Support for the amendment occurs in the original specification at page 11, lines 27-28 and in the Examples of the originally filed specification, wherein a box-shaped lithium ion secondary cell is prepared. Claim 10 is cancelled herein to prevent a redundancy with amended claim 1.

Accordingly, entry of the instant amendment is respectfully requested at present, as it finds full support in the application as originally filed, and does not raise any substantial new issues for the Examiners consideration, that would require any further search on the Examiner's part.

Claim Rejection Under 35 USC § 103(a)

Claims 1-4, 6-8 and 10 have been rejected by the Examiner under 35 USC 103(a) as being unpatentable over Kameda et al., U.S. Patent 6,632,569 in view of Japanese reference JP-2002-025612 and Kasamatsu et al., U.S. Patent 6,420,070 (newly cited). This rejection is respectfully traversed, and reconsideration and withdraw of the same is respectfully requested based on the following considerations.

The present invention is directed to a lithium ion secondary cell comprising a positive electrode, a negative electrode and a non-aqueous electrolyte solution. The negative electrode comprises a carbonaceous material, for example graphite and 2% or less of a binder, for example, a cellulosic ether compound and a butadiene copolymer rubber in a weight ratio of 1:1

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to 1:15. The non-aqueous electrolyte solution contains 0.5 to 5% by weight of vinylene carbonate or its derivative. The lithium ion secondary cell thus solves the problems associated with conventional secondary cells and possesses a high capacity and excellent charge-discharge cycling properties.

The Examiner, in relying upon the Kameda patent notes that the reference does not teach a specific amount of vinylene carbonate utilized, nor does it teach the use of cellulose ether in the binder. Thus, the Examiner must rely upon secondary references, that is, the Japanese reference and the Kasamatsu et al. patent to fill in the deficiencies of the Kameda patent. Although the Japanese reference relied upon by the Examiner appears to disclose a non-aqueous graphite anode battery wherein the non-aqueous electrolyte contains 0.5 to 10 wt. % of vinylene carbonate, there appears to be no recognition in this prior art reference of the use of the Applicant's binder as defined by the present invention. With this parameter of the present invention not being found in the prior art at this point, the Examiner then must go to still a third reference to show the use of styrene-butadiene rubber and carboxymethyl cellulose as a binder for a graphite negative electrode. The Examiner thus concludes that it would be obvious to fill the deficiencies of the Kameda et al. patent by relying upon the teachings of the Japanese reference and the Kasamatsu et al. patent to arrive at the Applicant's inventive contribution.

It is the Applicant's opinion that to produce the Applicant's inventive contribution, it is necessary to dissect bits and pieces from each of the secondary references and to argue that such reconstruction of the invention would be obvious to one skilled in the art. However, it is the Applicant's position that the only way that the Examiner can combine the references as suggested in the Office Action letter is to completely reconstruct the teachings of the references in view of the Applicant's own disclosure. However, even if, arguendo, one were to combine the references as suggested by the Examiner, such combination would still not suggest the present invention. Thus, none of the references relied upon by the Examiner suggest that the negative electrode comprises a mixture of cellulose ether compound and butadiene copolymer rubber in a

weight ratio of 1:1 to 1:15 as a binder. More particularly, none of the instantly claimed art references of record provide any motivation or teaching to those skilled in the art that would allow them to arrive at the invention recited in claim 1 as well as all of the claims dependent thereon.

The Examiner attempts to overcome the recitation in claim 1 which recites that “said negative electrode comprises a mixture of cellulose ether compound and a butadiene copolymer rubber in a weight ratio of 1:1 to 1:15,” by arguing that even in the absence of such a teaching in the Kasamatsu et al. patent, that it would have been obvious to have used the ether in a 1:1 ratio with the rubber because the same was merely used to suspend the rubber and graphite to form a paste in an aqueous solution and thus would fall within this range.

Under such a circumstance, the Examiner argues that the total amount of the binder would then equal 5% or less in the negative electrode. However, in Example 1 of the Kasamatsu et al. patent, 100 parts by weight of graphite, three parts by weight of a styrene butadiene rubber and an unknown amount of carboxymethyl cellulose were used. Assuming that the styrene-butadiene rubber and carboxymethyl cellulose were used in a ratio of 1:1 as argued by the Examiner, the actual percentage of the binder mixture in the negative electrode mixture amounts to 5.66% by weight $(3 + 3)/(100 + 3 + 3) = 5.66\%$ by weight. This amount of binder is much larger than the amount presently recited in amended claim 1 which now specifically states that the binders are present in an amount of 2% by weight or less based on the total weight of the negative electrode mixture.

As noted on page 2, lines 1-9 of the present application, it is indicated that to stabilize the electrode the binder should be added to the negative electrode in an amount of at least 5% by weight. However, using such an amount of binder acts to decrease the energy density per unit weight. Thus, to achieve a high energy density, that is, a large capacity of a battery, the amount of the binder or binder mixture should be much less than 5% by weight, that is, an amount of 2%

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or less as now recited in claim 1 of the present application. Thus, the present invention successfully decreases the amount of the binders in the negative electrode while increasing the capacity of the battery without sacrificing other properties by utilizing a specific combination of binders in a specific ratio, all of which is not recognized by the Kasamatsu et al. patent or any other references relied upon by the Examiner, either alone or in combination.

The Kasamatsu et al. patent does not describe the amount of carboxymethyl cellulose and thus does not specify any ratio of styrene-butadiene rubber and carboxymethyl cellulose. In addition, as can be seen from Table 2 on page 19 of the present application, the present invention can prevent the expansion (increase in thickness) of a battery after storage at a high temperature. This effect is very important in the case of a box-shaped battery as recited in claim 1 of the present application.

Accordingly, even if, arguendo, it would be possible to combine the references as suggested by the Examiner, because of the failure of the prior art to recognize the importance of the weight ratio of the cellulose ether compound and the butadiene copolymer which, in effect, defines the percentage of the binder mixture in the negative electrode, it is believed that the prior art relied upon by the Examiner cannot possibly suggest the present invention which recognizes that by decreasing the amount of the binders in the negative electrodes, the capacity of the battery can be increased without sacrificing other properties. The percentage of the binder mixture in the negative electrode of the Kasamatsu et al. patent which is 5.66% by weight is far larger than the 2% by weight or less as now recited in claim 1 of the present application which is supported on page 11, lines 27-28 of the present application.

CONCLUSION

Accordingly, in view of the above amendments and remarks, reconsideration of the rejection and allowance of all of the claims of the present application are respectfully requested. In the event that the proposed Amendment does not place the present application into condition

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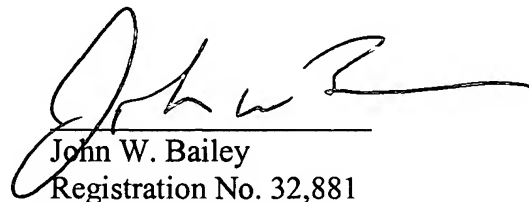
for allowance, entry thereof is respectfully requested as placing the present application into better condition for appeal.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact John W. Bailey (Reg. No. 32,881) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

A handwritten signature in black ink, appearing to read "John W. Bailey", is written over a horizontal line.

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